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The evolving mission of modern zoos and aquariums: An internal appraisal

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The evolving mission of modern zoos and aquariums: An internal appraisal

by

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ABSTRACT

This project was undertaken to gain insight into the understanding and attitudinal stance of zoo and aquarium staff towards the proposed mission for modern institutions. Telephone surveys were conducted with 222 personnel from 49 American Zoo and Aquarium Association (AZA) accredited facilities. The randomly selected sample was blocked by operating budget size with staff from five distinct areas of responsibilities: upper management, middle management, education, zookeeper, and visitor services.

The results showed that nearly all of the differences occurred between positions and not institution size. Responses were consistent with the following aspects of the proposed mission for modern institutions:

- Captive breeding for reintroduction is not viewed as the best method for zoos and aquariums to contribute to wildlife conservation.
- *In-situ* conservation is viewed as a responsibility of modern institutions. Staff members value networking and want to develop their own programs, not simply give financial support to other organizations.
- Proactive, political involvement is important for future institutions.
- Conservation education needs to motivate people to action and zoos and aquariums may be in a unique position to do so.

Professional organization involvement (especially with the AZA), a wide range of work experiences, increased formal education, continuing education experiences, and an awareness of one's own institution all contribute to a greater understanding, acceptance, and dedication to the future role of zoos and aquariums as potential, powerful and effective conservation organizations.

INTRODUCTION

The "Noah's Ark" concept has been the underlying foundation of zoo- and aquarium-based conservation since the late 1970's and early 1980's. The establishment of the American Zoo and Aquarium Association's (AZA) Species Survival Plan (SSP) in 1981 verified that zoos viewed their role as breeding centers of endangered species. This concept revolves around the idea that threatened and endangered species could be held in captivity for some unspecified length of time (e.g., 100-200 years), bred in captivity, and then reintroduced into protected or restored habitats at a future time. This concept played an important role in the evolution of zoo philosophy, as it promoted conservation at a time when recreation was the primary focus (Hutchins et al., 1996).

Recently, however, captive breeding with reintroduction as the primary focus and best way for zoos to contribute to the conservation of wildlife has been questioned (Wiese and Hutchins, 1993; Conway, 1995c; Hutchins and Conway, 1995; Hutchins et al., 1996; Snyder et al., 1996; Conway, 2000). The rapidly increasing numbers of endangered species, the limited zoo capacity to hold and breed animals, the lack of habitat suitable for reintroduction, the expense, and technical difficulties all suggest that this may be an inappropriate use of zoo and aquarium resource dollars.

These difficulties, plus the realization that there are many more ways that captive animal populations can contribute to conservation beyond captive breeding for reintroduction, has led to a proposed much broader conservation mission for zoos and aquarium (Hutchins and Fascione, 1993; Conway, 1995a; Hutchins et al., 1996; Croke, 1997; Hutchins and Vehrs, 1998; Mallison, 1998; Conway, 2000; Hutchins, 2003; Hutchins and Smith, 2003). This new vision includes: public education that leads to conservation action,

scientific research, technology development and transfer; networking with other conservation organizations; fund-raising to support field conservation and habitat preservation; active involvement in *in-situ* ("in the wild") conservation projects; and political involvement.

Conway (1995a; 1995c) considers this broader vision vital to the transformation of "zoos" into "conservation parks". Rather than focusing intensive efforts on the propagation of species one by one, the aim would be the preservation of habitats and communities through "interactive zoo-wild management" (Conway, 1995b). In this way, zoos and aquariums could become proactive and leaders in the conservation of wildlife by sustaining wildlands, reserves and species. Conway (2000) states that effective zoos and aquariums of the 21st century will be committed to helping sustain wildlands and reserves through applied ecology, supporting less-developed countries' institutions and preserves, and ultimately becoming wildlife conservation care-givers and act as intellectual resources.

When one considers that an educated, enlightened, and motivated public will be supportive of and provide the resources to achieve these modern zoo goals, conservation education becomes a key mission of institutions with living collections (Berkovits, 1995). Jones (2000) believes that long-term conservation success depends on life science institutions creating a personal connection for the public - a connection that makes the relationship between ecology and the public's well being easy to understand. This could be accomplished for visitors through education programs and exhibit interpretations that not only engage and excite but also act as a bridge to understanding and motivate visitors to action.

This project seeks to evaluate how current ideas on the role of accredited zoological parks and aquariums in North America are understood and valued among the professionals

who operate and manage them. Even though this is an observational study, the following general hypothesis was used in the development of the project:

"Zoo professionals that are highly educated, have a diverse range of work experiences, participate in continuing education efforts, are involved in AZA and other professional organizations, and are aware of their own institutions programs are supportive and understand the proposed mission for modern zoos and aquariums."

Figure 1 is intended to depict the increased complexity of the proposed mission for zoos and aquariums of the future. In particular, it should be noted:

1. At the base, zoos and aquariums are shown to collaborate extensively with other organizations to accomplish their conservation goals.
2. Education has changed from being an off-shoot of what zoos and aquariums do, to becoming a major objective. Conservation education, which inspires people to act, is viewed as a primary tool and vital to achieving conservation goals.
3. Rather than captive breeding being the main way that zoos and aquariums could contribute to conservation, it is now only one of the avenues used.
4. Research (both *in-situ* and *ex-situ*) is viewed as a new way to contribute.
5. Recreation remains a part of what occurs at zoos and aquariums, but rather than an end in itself, the modern vision includes it as a tool to inspire concern and action.

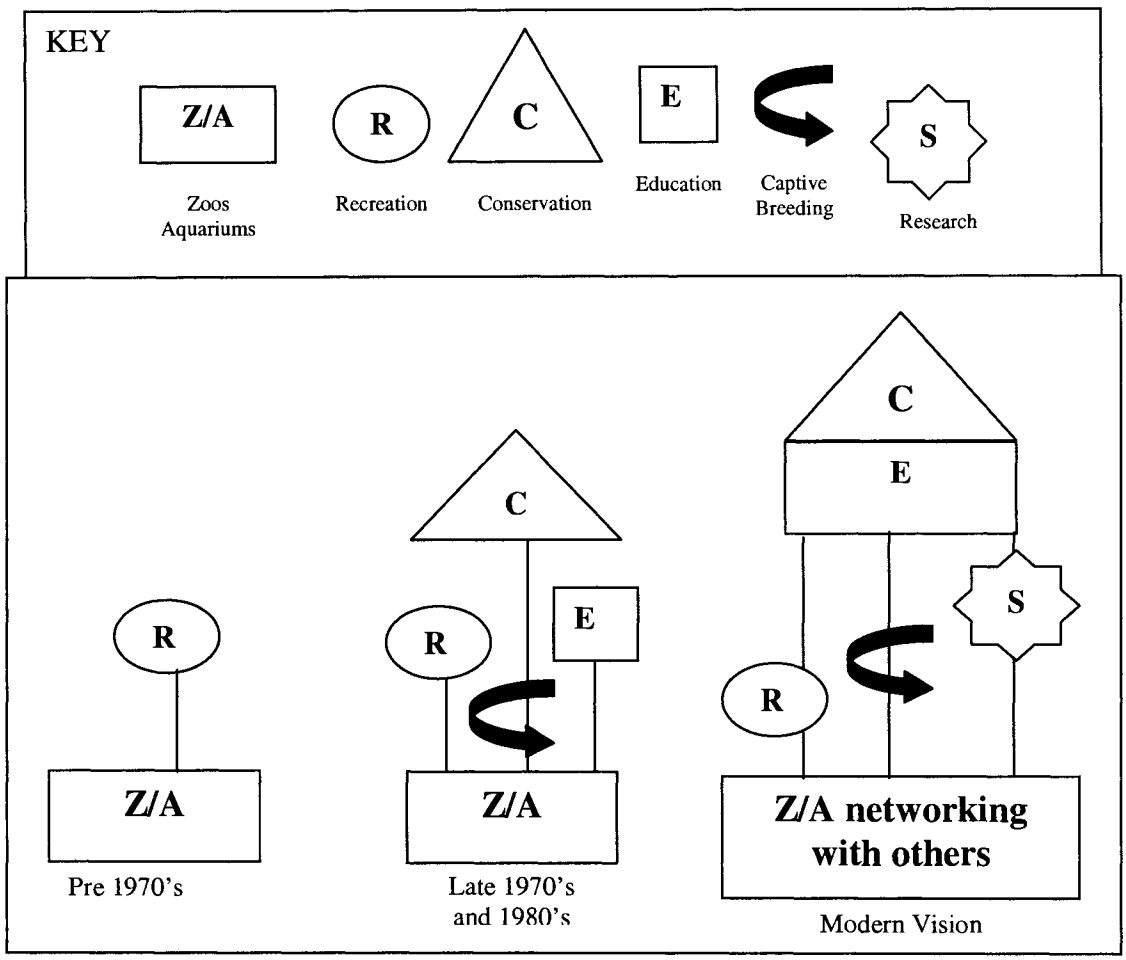

Figure 1. Graphic Model of the proposed changes in the mission of modern zoos and aquariums.

MATERIALS AND METHODS

Overview

Data were collected through telephone interviews with staff members from five distinct responsibility levels from 49 randomly selected zoos and aquariums; these represented approximately 25% of the total 2000 American Zoo and Aquarium Association institutional membership. The institutions were divided into three blocks according to operating budget size. Statements were developed that concerned various aspects of the proposed mission for modern zoos and aquariums. Participants responded using a nominal scale (i.e., 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree). Demographic information was also gathered for each participant. SAS software was used to perform the statistical analysis. Data were analyzed using least squared means comparisons and by checking for significant differences between zoo sizes and positions. Principal factor analysis was used to combine demographic information into a single "demographic factor score" that was then used as an effect in an analysis of covariance with responses to the statements as dependent variables.

Sample Selection

Institutions. Anticipating that zoo size may be a potential factor in differences in responses, zoos were statistically blocked by operating budget size. Moretti (1999) was used to graph the operating budgets of all 189 member institutions listed (see Appendix A, Figure 17). There appeared to be natural divisions at approximately $5 million and $17 million. These amounts divided the membership into three operating budget sizes: < $5, $5 to $17, and >$17 million; hereafter, they will be called small, medium, and large, respectively. Consequently, these categories put 117 (61.9%) institutions into the small, 49 (25.9%) into

the medium, and 23 (12.2%) in the large operating budget sizes (see Appendix B). A direct proportion allocation relative to operating budget sizes was used to determine sample sizes for this project. This tesulted in sample sizes of 29 small, 12 medium, and 6 large. Individual institutions were grouped by size, numbered in alphabetical order, and then the appropriate sample size was chosen using a random numbers table (Steel, R. and J. Torrie, 1980).

In consideration of a possible bias by region of the U.S., the entire AZA institutional membership was categorized according to the following regions: Western, Central, and Eastern (see Appendix B). The boundaries of the regions were taken from Moretti (1999). Several random samples were drawn for each zoo size and the one that matched the closest to the entire membership regional distribution was used. The actual distribution was: for small sized - 23% Western, 42% Central, and 35% Eastern; for medium sized - 25% Western, 37.5% Central, and 37.5% Eastern; for large sized: 35% Western, 26% Central, and 39% Eastern.

Staff members. Once the sample institutions were selected, a letter was sent to upper management explaining the project and asking for permission to interview their staff. If permission was not granted, a replacement institution from the appropriate size category was randomly selected in its place. The individual staff members were selected by upper management or their designee. A staff person was requested from each of the following positions: Upper management, Middle management, Education, Zookeeper, and Visitor Services. If a staff person for a particular position was not available (due to time constraints, vacancy, or the institution did not have such a position) it was skipped. No institution with less than three staff members available for interview with one of them being either upper or middle management was included in the study

Questionnaire Development

Focus group. After researching the literature on the evolving mission of modern zoos and aquariums, a focus group was held at the 1999 American Zoo and Aquarium Association National Conference to discuss the future roles of zoos and aquariums. AZA officers, directors, and staff were invited to attend and share their viewpoints on the topic. Several educators attended as well, with approximately 20 individuals present. Notes from this group were used for initial questionnaire development.

Demographic variable. Data were collected on seven areas that that were considered part of the individual's background. These categories were each scored and included:

1. Formal Education Level: (Potential score between 1 and 5)
   0=Did not graduate from high school
   1=High school
   2=Associate's degree/less than four years of college
   3=Undergraduate degree
   4=M.S.
   5=Ph.D.

2. Experience Score: (Potential score between 1 and 8)
   1=First position at a zoo/aquarium
   2=Other experience at the same institution
   3=Same job at another institution
   4=Other experience at another institution
   5=2 and 3
   6=2 and 4
   7=2, 3, and 4 OR 3 and 4
   8=experience at four or more institutions

3. Continuing Education Score: One point was given for each of the following categories, if Occurring in the last 5 years. (Potential score between 0 and 7).

   College courses
   Attending conferences
   Workshops/training seminars
   Employer-provided training
   AZA school classes
   Self-guided reading
   any other type of continuing educational experience

4. Professional Involvement Score: Points were given for involvement in up to five national professional organizations. For each organization, respondents received a 1 if a member, 2 if they attended a conference, 3 if they were ever a committee member, and 4 if they ever held an office. The highest scores given for each organization were summed. (Potential score between 0 and 20)

5. American Zoo and Aquarium Participation: Respondents received a 1 if they were a member, 2 if they had attended a conference, 3 if they were ever a committee member, and 4 if they ever held an office.

   (Potential score between 0 and 4)

6. Informed: Respondents chose a number that reflected how well-informed they felt about topics at their institutions. 1=Not informed, 2=Somewhat informed, 3=Informed, and 4=Very informed. The topics were: animal management programs, educational programs and goals, upcoming special events, institutional master plan, and institutional mission statement. The scores for each topic were added together.

   (Potential score between 5 and 20)

7. Institutional knowledge: Interviewees were asked three questions pertaining to their own institutions: number of full-time permanent employees; annual attendance estimate (given choice of nine categories); and operating budget size (given a choice of 12 categories). Ballentine et al (2001) was used to check the accuracy of their estimates. Interviewees received a score of 1 if correct, 0 if incorrect. They were correct if they had estimated the number of employees +/- 10%. A correct score was given on attendance and budget size if they were within +/- one category. (Potential score between 0 and 3)

Statements. In order to test how well the proposed mission for modern zoos and aquariums was understood and valued by zoo and aquarium professionals, statements were developed and the interviewees were asked to rank their attitudinal stance according to one of the two following nominal scales:

1=Not Important at all, 2=Not Important, 3=Neutral, 4=Important, 5=Very Important
Or
1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

The statements were designed to address five areas relating to the proposed mission:

1. captive breeding/reintroduction
2. *in-situ* conservation
3. conservation education
4. political involvement
5. zoo management topics

Many of the statements were taken directly or with minor rewording from the works of Conway (1995a, b, c, 2000), Hutchins and Conway (1995), Hutchins (2003), and Hutchins and Smith (2003).

Questionnaire pre-testing. Part of the final drafting of the questionnaire included pre-testing by going through the questionnaire with six zoo staff from institutions not in the sample. This allowed for determination of the potential range of responses, thought process flow problems, and misconceptions with the statements and questions. Dr. Michael Hutchins, AZA conservation director, reviewed and commented on the statements prior to completion.

Interview Process

Principal investigators underwent web-based training from Iowa State University on the protection of human subjects in research. Topics covered included:

- The historical perspectives of human subjects research
- The Belmont Report
- The federal regulations
- Assurances of compliance
- Institutional Review Board composition and duties
- Elements of informed consent

The principal investigators then trained and supervised two assistants on human subjects research. These assistants conducted some of the interviews and made appointments with interviewees. Interviewees were asked to budget approximately 30 minutes for the interview. Interviews were conducted over an eight-month period. A total of 222 interviews were completed.

Analysis

After completion, all questionnaires were scored and the data were entered into spreadsheets. SAS software was used to perform statistical analysis. Analysis of variance (ANOVA) was used to study the seven demographic variables regarding least square means

(lsmeans) and relationships to zoo size and position. Principal factor analysis was used to investigate combining the demographic information into fewer 'demographic factors' – it indicated only one was necessary. This process indicated that all seven demographic variables could be combined into one factor. The partial correlation coefficients (r) between all factors were either near zero or in a weak positive direction. It is standard procedure to use only the number of factors indicated by Eigenvalues > 1. For this data set, the Eigenvalue for a single factor was > 1 (actual 2.15) while the value for a second factor was only 0.147. This combined demographic factor score was standardized, so that on a linear scale the mean is equal to zero.

To investigate the relationships between responses to the statements and the combined demographic score, the score was then used as the covariate in an analysis of covariance with the responses to each statement as the dependent variables. Consequently, if there is a significant, positive relationship (slope > 0) between the response and the demographic score it indicates that as the combined demographic score increases, the response to the statement also increases. A significant, negative relationship (slope < 0) indicates that as the combined demographic score increases, the response to the statement decreases.

This procedure allows insight into what the relationships exist between the responses to the statements and the various demographic factors used in the study: formal education, experience, continuing education, professional organization involvement, AZA participation, institutional knowledge and awareness. This information most directly relates to the stated hypothesis – that as the demographic score increases the response value should reflect greater acceptance and understanding of the proposed mission for modern zoos and aquariums.

RESULTS AND DISCUSSION

Sample Distribution

Table 1 displays the entire sample of interviewees (222) by both position and zoo size. Our direct proportion allocation method resulted in the categories of zoo size (small, medium, and large) being unbalanced, though the number representing each position (upper management, middle management, education, zookeeper, and visitor services) were nearly equal.

Table 1. Total sample distribution by zoosize and position.

	POSITION				
ZOOSIZE	1, Upper	2, Mid	3, Edu	4, Zook	5, Vis Ser
Small	28	27	28	25	23
Medium	13	12	13	13	12
Large	6	6	5	6	5
222	47	45	46	44	40

Key: 1, Upper = Upper management; 2, Mid = Middle management;
3, Edu = Education; 4, Zook = Zookeeper; 5, Vis Ser = Visitor services

Demographic Comparisons

Tables 2 and 3 display, by position and zoo size respectively, the least squared means (lsmeans) and statistically significant differences for all seven demographic variables.

Table 2: Least square means for demographic variables by position.

	POSITION				
DEMOGRAPHIC VARIABLE	1, Upper	2, Mid	3, Edu	4, Zook	5, Vis Ser
Formal Education Level (0-5)	3.45***	2.98	3.47***	2.57	2.26
Experience Score (1-8)	3.71*	4.02*	3.00	2.50	1.78
Continuing Education Score (0-7)	4.63*	5.08***	4.99***	4.46	3.84
Prof. Organization Involvement (0-20)	5.15***	3.82**	4.72**	2.75	1.84
AZA Participation (0-4)	2.76*	2.19***	2.12*	0.98	0.51
Informed (5-20)	17.99**	15.85**	16.63**	13.88	14.69
Institutional Knowledge (0-3)	2.44***	2.19	2.14	1.62	1.94

Values with asterisks are significantly different from one or more of those that are underlined within each variable. * p<.05, ** p<.01, *** p<.001.

Table 3: Least square means for demographic variables by zoosize (all positions combined).

	ZOOSIZE		
DEMOGRAPHIC VARIABLE	Large	Medium	Small
Formal Education Level (0-5)	2.98	3.12*	2.74
Experience Score (1-8)	3.13	3.11	2.76
Continuing Education Score (0-7)	4.65	4.69**	4.46
Prof. Organization Involvement (0-20)	3.78	4.18	3.01
AZA Participation (0-4)	1.81	1.85	1.47
Informed (5-20)	15.81	15.48	16.12
Institutional Knowledge (0-3)	1.97	2.05	2.18

Values with asterisks are significantly different from those that are underlined within each variable. * p<.05, ** p<.01, *** p<.001.
Key: 1, Upper = Upper management; 2, Mid = Middle management; 3, Edu = Education; 4, Zook = Zookeeper; 5, Vis Ser = Visitor services

Formal education level.

The upper management and education positions had received the most formal education, especially when compared to zookeeper and visitor services positions. Their lsmean score is equivalent to between a four-year degree and a master's degree. The lsmean score for zookeeper and visitor services was equivalent to between an associate's degree and a four-year degree. Middle management was not significantly different from any of the others. Fewer differences were found based on zoo sizes. A significant zoo size difference was found between the overall lsmean for medium and small. Medium was equivalent to just above a four-year degree and small to just below.

Experience score.

The upper and middle management had scores significantly higher than zookeeper or visitor services. Interpretation of the lsmean score is difficult considering the subjective way experience was valued; however, the score for upper and middle management could be viewed as having at least one experience at another institution as either the same position or as another type of position. Zookeeper and visitor services lsmean scores could be viewed as

being their first job at a zoo or aquarium plus having some other experience at the same institution or perhaps the same position at another institution.

Continuing education score.

Upper management, middle management, and education all had significantly higher continuing education scores than visitor services. Their scores were equivalent to having participated in four or more continuing education activities in the last five years. Visitor services' score is equivalent to having participated in less than four. Zookeeper was in-between and was not significantly different from any other position.

Professional involvement score.

Regarding professional involvement, upper management and education scored significantly higher than both zookeeper and visitor services. Middle management was also significantly higher than visitor services. Interpretation of the lsmean score is subjective, but could be viewed as upper and middle management and education, on average, are members of at least two professional organizations and have attended at least two conferences. In comparison, zookeeper and visitor services, on average, are members of one professional organization and have attended at least one conference. There was also a significant difference between middle and small size zoos, with middle size's score for professional involvement being larger.

American Zoo and Aquarium Association participation.

Regarding AZA participation, there was a clear division between the upper management, middle management, education positions and the zookeeper, visitor services

positions. The lsmean scores could be viewed as upper, middle and education positions are members, attended an AZA conference and have participated in some type of committee work for the AZA. The score for the zookeeper position could be viewed as they are members. Visitor services could be viewed as, on average, half are not members.

Informed.

Upper management rank their "informed" level as significantly greater than all other positions, except education. Upper management's score could be viewed as that they feel informed to very informed about all five areas. Middle management and education rated their "informed" level relatively close to informed for all categories. Zookeeper and visitor service scores could be viewed as that they feel less than informed concerning some of the areas about which they were asked.

Institutional knowledge.

The only significant difference was between upper management and zookeeper. Upper management scored just under having all three institutional questions correct and zookeeper scored between one and two correct.

Demographic variable discussion.

The significant differences occur mainly between positions, not zoo sizes. Using the scoring methods devised for this project, there appears to be a statistically significant division among the five positions. In general, upper management, middle management, and education scored similar to each other and statistically higher than zookeeper and visitor service positions in all demographic variables.

Zoo and Aquarium Mission

To reflect on a participant's consistency of answers, statements concerning a topic were asked in several different ways in the interview. For clarity, all statements were grouped by topic area for analysis and renumbered in sequential order. Interviewees were asked to rank their attitudinal stance according to one of the two following nominal scales depending on the statement.

Type I questions asked for their opinions on the relative importance of a topic.

1=Not Important at all, 2=Not Important, 3=Neutral, 4=Important, 5=Very Important

Type II questions asked for their reactions to an affirmative statement.

1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

Questions of type I are indicated by parentheses. Others are all type II.

Captive Breeding/Reintroduction

There were six questions relating to captive breeding for reintroduction. Table 4 gives the lsmean responses and significant differences by zoo size and position.

1. **Zoos and aquarium can best participate in saving endangered species from extinction by captive breeding for reintroduction.**
2. **Captive breeding for reintroduction.** (Type I)
3. **Captive breeding for reintroduction is a strategy that can be applied to nearly every species at risk of extinction.**
4. **Strategies that work towards the preservation of wildlife habitats and communities, not the intensive propagation of species one by one, are the keys to controlling the loss of biodiversity.**
5. **Captive breeding to sustain populations to reduce the need to use wild-caught specimens.** (Type I)

6. **Artificial reproduction techniques developed by zoos (such as artificial insemination and embryo transfer) will someday be necessary to maintain genetic diversity in small, isolated wild population.**

Table 4: Least squares means responses and significant differences by zoo size and position to statements regarding captive breeding/reintroduction.

STATEMENT #	LSMEAN	DIFFERENCES BY ZOO SIZE	DIFFERENCES BY POSITION
1	3.16	N.S.	N.S.
2	4.31	N.S.	N.S.
3	---	*1	N.S.
4	4.07	N.S.	N.S.
5	---	*2	N.S.
6	3.85	N.S.	N.S.

*1 – Large sized zoos (lsme=2.14) had lower scores than small (lsm=2.81) and medium (lsm=2.87) sized zoos p=.0113 and .0328, respectively.
*2 – Large sized zoos (lsm=5.03) had higher scores than small (lsm=4.53) and medium (lsm=4.62) sized zoos p=.0021 and .0270, respectively.
N.S.: Not significant.

Captive breeding/reintroduction discussion

There were no significant differences among positions for any of the statements relating to the importance of captive breeding or the practicality of reintroduction. Statement #1 specifically addresses the role of captive breeding for reintroduction as the best way for zoos and aquarium to participate in saving endangered species. The overall lsmean response was equivalent to neutral. This suggests an understanding that perhaps there are other ways for zoos and aquarium to participate, as stated by Conway (1995c), Hutchins and Conway (1995), and Hutchins and Smith (2003). However, captive breeding for reintroduction is still considered an important contribution that zoos and aquarium can make, as evidenced by lsmean score of 4.3 (important – very important) for statement #2. The limitations of captive breeding for reintroduction (Snyder, et all, 1996) seem to be understood by all positions as

evidenced by an overall lsmean score of 3.0 (neutral) or less for statement #3, which addresses the practicality of reintroduction. It appears that staff at large sized institutions (lsmean score 2.14) may understand that concept even better, as evidenced by a significant difference between them and the medium (2.87) and small sizes (2.81). It also appears that, on average, all positions agree with the general idea that conserving habitats and communities and not individual species propagation (Meffe, et all, 1997), (Conway, 2000) is the key to wildlife conservation as evidenced by a lsmean of 4.04 (agree) for statement #4.

Two values of captive breeding other than for reintroduction were addressed in statements #5 and #6. Hutchins, et al. (1996) suggested captive breeding to sustain captive populations to reduce the need for wild-caught specimens and Conway (1995a) suggested reproductive techniques developed by zoos will someday be necessary to maintain genetic diversity in wild populations. Both of these concepts appear to be agreed upon by all positions, as evidenced by lsmean scores of around 4.0 or greater (agree to strongly agree). Again, staff at large sized institutions may understand the concept even more, as evidenced by their overall lsmean to statement #5 of 5.0 (strongly agree).

In-situ Conservation

There were 11 statements relating to in-situ conservation aspects. Table 5 gives the lsmean responses and significant differences by zoo size and position.

7. **Zoos' and aquariums' greatest potential service to society is to directly help sustain wildlife in nature by sustaining wildlands, reserves and species.**
8. **As holders of captive wildlife, zoos and aquariums have a moral obligation to assist directly in wildlife and habitat conservation.**
9. ***In situ*, or "in the wild", conservation should be among the basic responsibilities of any modern zoological institution or aquarium.**

10. **The goal of all zoo and aquarium based conservation programs should be to preserve animals and their habitats in nature, not simply to perpetuate captive populations.**

11. **All new exhibits should have educational messages that emphasize *In Situ* or "in the wild" conservation – they should effectively build a bridge between the exhibit and what is happening to the animals in nature.**

12. **Financial support of conservation efforts in other countries.** (Type I)

13. **Organizations such as the World Wildlife Fund, Conservation International, and The Nature Conservancy are better suited and more capable than zoos and aquarium to lead *in situ* conservation efforts of all kinds. Zoos and aquariums should simply provide these organizations with money, rather that attempting to build their own programs.**

14. **Involvement in local conservation projects.** (Type I)

15. **Zoos and aquariums that do not contribute to *in situ* conservation risk losing their relevance and credibility in a rapidly changing world.**

16. **Maintaining captive populations of wild animals in zoos – by itself- is a significant contribution to the conservation of wildlife and their habitats in nature.**

17. **Zoos and Aquariums seldom participate in species habitat restoration.**

Table 5: Least squares means responses and significant differences by zoo size and position to statements regarding *in-situ* conservation.

STATEMENT #	LSMEAN	DIFFERENCES BY ZOO SIZE	DIFFERENCES BY POSITION
7	4.12	N.S.	N.S.
8	4.61	N.S.	N.S.
9	3.95	N.S.	N.S.
10	4.44	N.S.	N.S.
11	4.88	N.S.	N.S.
12	---	N.S.	*1
13	1.89	N.S.	N.S.
14	4.75	N.S.	N.S.
15	3.89	N.S.	N.S.
16	3.70	N.S.	N.S.
17	2.33	N.S.	N.S.

*1 – Zookeepers (lsm=4.53) had higher scores than visitor services (lsm=3.95), p=.0336.
N.S.: Not significant.

In-situ conservation discussion

There were no significant differences in lsmeans between zoo sizes and only one minor difference by position for all eleven statements. A lsmean of 4.12 (>agree) for statement #7 suggests that all positions agree with Conway (2000) when he states that zoos' and aquariums' greatest potential service to society is to directly help sustain wildlife in nature by sustaining wildlands, reserves, and species. The lsmeans for statements #8 (4.61) and #9 (3.95), would suggest that all positions feel that zoos and aquariums have a moral obligation to assist directly in wildlife and habitat conservation: in fact, *in-situ* conservation should be a basic responsibility and be the goal of all zoo and aquarium conservation

programs. All positions agree to strongly agree with Hutchins, et al. (1996) as evidenced by the lsmean score to statement #10 of 4.44 that the goal of all zoo and aquarium based conservation programs should be to preserve animals and their habitats in nature, not simply to perpetuate captive populations. The idea is continued with statement #11 (overall lsmean 4.88) to also agree with Conway (2000) that all new exhibits should have educational messages that emphasize *in-situ* conservation – they should effectively build a bridge between the exhibit and what is happening to the animals in nature.

There are some differences when it comes to financial support for *in-situ* conservation. Generally it is agreed that modern institutions should give financial support to other countries, but statement #12 showed a significant difference between zookeeper (4.53, >agree) and visitor services (3.95, <agree). However, it is clear from the lsmean of statement #13 (1.89, < disagree) that all positions want institutions to build their own *in-situ* conservation programs and not simply provide money to other established organizations. Statement #14 (lsmean 4.74, >important) reveals that all positions believe that involvement in local conservation projects should be an important function of modern zoos and aquarium.

There is not strong agreement with Hutchins and Conway (1995) and Hutchins (2003) that institutions may actually lose their relevance and credibility if they do not participate in *in-situ* conservation. Statement #15 has a lsmean of only 3.89, which could be interpreted as a weak agreement. There does seem to be recognition that simply maintaining captive populations of wild animals in zoos - by itself - is not a significant contribution to the conservation of wildlife and their habitats in nature, as evidenced by the lsmean for statement #16 (3.70) between neutral and agree. The response to statement #17 (2.33) indicates a

neutral to slight disagreement with the statement that says institutions seldom participate in habitat restoration.

Conservation education

There were six statements relating to conservation education aspects. Table 6 gives the lsmean responses and significant differences by zoo size and position.

18. Informational signage about the natural history of a species or habitat is "conservation education".

19. Zoos and aquariums educational efforts should be focused on children, in an effort to create enlightened decision-makers

20. The most important audience that educational programs can reach are adult groups, especially those in positions of the greatest influence, since they are the ones responsible for current legislative decisions

21. Conservation education initiatives are likely to be most successful when focused on local conservation issues.

22. Zoos and aquariums could do a better job of teaching the public about the relationship between human population growth, environmental destruction, and the fate of wildlife and their habitats.

23. Education is the thing that zoos and aquariums do best. There is ample evidence that they make a positive difference for wildlife and nature.

Table 6: Least squares means responses and significant differences by zoo size and position to statements regarding conservation education.

STATEMENT #	LSMEAN	DIFFERENCES BY ZOO SIZE	DIFFERENCES BY POSITION
18	4.03	N.S.	N.S.
19	4.02	N.S.	N.S.
20	3.10	N.S.	N.S.
21	---	*1	*2
22	---	N.S.	*3
23	---	***4	*5

* p<.05, ** p<.01, *** p<.001.
*1 – Medium sized zoos (lsm=3.29) had lower scores than small (lsm=3.75) sized zoos, p=.0233.
*2 – Education (lsm=4.04) had higher scores than zookeeper (lsm=3.28), p=.0222.
*3 – Middle management (lsm=4.54) had higher scores than visitor services (lsm=3.85), p=.0174.
***4 – Medium sized zoos (lsm=3.29) had lower scores than small (lsm=4.00), p<.0001.
*5 – Upper management (lsm=4.03) and education (lsm=3.83) had higher scores than zookeeper (lsm=3.28), p=.0055 and .0339, respectively.
N.S.: Not significant.

Conservation education discussion

Hutchins (2003) and Hutchins and Smith (2003) point out that true conservation education needs to inspire people to change their attitudes and behavior to benefit wildlife. They consider informational graphics alone not to be effective or satisfactory. It appears from the lsmean for statement #18 (4.03 = agree) that perhaps all positions do not recognize the real or updated definition of "conservation education". Conway (2000) and Hutchins and Smith (2003) suggests that modern institutions should consider focusing their conservation message to reach major decision-makers rather than children due to the urgent need for change. The overall lsmean for statement #19 (4.02 = agree) and the lsmean for statement #20 (3.10 = neutral) suggests that all positions still tend to hold onto past strategies. They agree with focusing on children and are neutral about focusing on adult groups.

There are differences when it comes to statement #21, regarding conservation initiatives being more likely successful if focused on local conservation issues. Hutchins (2003) suggests educational efforts should be focused where the problem is most relevant, i.e. local. By focusing on local issues, zoos and aquariums could be important catalysts to inspire volunteerism in North America.

There was a significant difference between middle management and zookeeper lsmeans (4.54 and 3.85, respectively); however, all positions tend to agree with statement #22: "our institutions can do a better job teaching the public about the relationship between human population growth, environmental destruction, and the fate of wildlife and their habitats". This indicates the cautious desire of zoos and aquariums to move into more controversial environmental issues. Statement #23 is ambiguous in that there are two distinct parts within the one statement, points that could be answered contradictory. First it states that education is the thing that zoos and aquariums do best. Secondly, it states that there is ample evidence that they make a positive difference for wildlife and nature. The statement was meant to reiterate the point that Hutchins (2003) makes regarding the suggestion that modern zoos and aquariums need to develop effective tools to measure the impact of educational programs. Since that process is ongoing, most zoo professionals would like to think that their programs do make a positive difference, but measurable "evidence" is difficult to achieve or find in the published literature. Most positions had lsmeans equivalent to somewhere between neutral and agree. The statistically significant differences were between upper management, education and the zookeeper positions (4.03, 3.83, and 3.28, respectively). This may indicate that upper level management is more optimistic about such evidence than other positions. There was a significant difference between small size and medium sized zoos as

well, with small size zoos giving a higher lsmean (4.0 vs. 3.29). Perhaps this suggests medium sized institutions are more aware of the lack of evidence to support the positive difference zoos' and aquariums' educational efforts may make.

Political involvement

There were two statements regarding political involvement.

24. Proactive political involvement - including lobbying for regional and local legislation that benefits wildlife species and their habitats. (Type I)

25. Political advocacy and a working relationship with local legislative figures should be a priority for zoos and aquariums.

These statements had overall lsmeans of 3.90 and 4.32, respectively. There were no significant differences between zoo sizes or positions on these statements.

Political involvement discussion

Hutchins (1999), Hutchins and Conway (1995), and Hutchins and Smith (2003) point out the need for modern institutions to become more proactive politically and influence beneficial legislation. Both statements #24 and #25 suggest that all positions agree (3.90 and 4.32, respectively).

Zoo management Topics

There were six statements regarding various topics of concern regarding zoo management. Table 7 gives the lsmean responses and significant differences by zoo size and position.

26. Modern zoos and aquariums are experts at creating naturalistic artificial environments for wildlife, a skill that could pre-adapt them for work in ecological restoration.

27. Networking and forming partnerships among conservation organizations. (Type I)

28. Modern institutions should work towards eliminating substandard, non-accredited zoos and aquariums.

29. Beyond recovering costs associated with breeding and rearing, large profits from the sale of animals should not occur.

30. The recreational benefits that zoos and aquariums provide to their local communities, by themselves, are enough to justify keeping wild animals in captivity.

31. Continuing educational experiences for staff. (Type I)

Table 7: Least squares means responses and significant differences by zoo size and position to statements regarding zoo management.

STATEMENT #	LSMEAN	DIFFERENCES BY ZOO SIZE	DIFFERENCES BY POSITION
26	---	*1	N.S.
27	4.48	N.S.	N.S.
28	3.49	N.S.	N.S.
29	4.56	N.S.	N.S.
30	---	N.S.	*2
31	4.62	N.S.	N.S.

* p<.05, ** p<.01, *** p<.001.
*1 – Medium sized zoos (lsm=2.83) had lower scores than small (lsm=3.26) sized zoos, p=.0384.
*2 – Upper management (lsm=3.32) had higher scores than middle management (lsm=1.50) and education (lsm=2.05), p=.0023 and .0353, respectively.
N.S.: Not significant

Zoo management discussion

Statement #26 has two parts and the interviewee had to agree with both plus feel like they were related. The first part stated that zoos and aquariums are experts at creating naturalistic artificial environments for wildlife. The second part was that this skill could pre-adapt them for work in ecological restoration. Apparently, with lsmean scores around 3.0 or neutral, most positions did not have strong feelings about the statement or the double question tended to cancel each other out.

Networking and forming partnerships among conservation organizations (statement #27) had a lsmean of 4.48, interpreted as being considered important to very important by all positions. This would indicate agreement with Hutchins (1999, 2003), who stated modern zoos and aquariums will need to develop effective partnerships with other non-profit organizations, government wildlife agencies and corporations that have similar goals.

Statement #28 was regarding the importance of modern institutions working to eliminate substandard, non-accredited zoos and aquariums as noted in Hutchins (2003). The overall lsmean was only 3.49 (between neutral and agree) and may indicate some overall indecisiveness on the part of interviewees to see that as their role. However, there appears to be strong agreement with Hutchins (2003) suggestion that modern institutions work to de-commercialize the exotic animal business and share animals with one another cooperatively. Statement #29 stated that large profits from the sale of animals should not occur. The overall lsmean was 4.56, indicating an equivalent of agree to strongly agree for all positions.

Statement #30 addressed the issue of the relative importance of the recreation function of institutions and keeping animals in captivity. Generally, all positions were either neutral or were near disagree. This may be interpreted as the interviewees believe that the recreation value alone is not a good enough reason to keep animals in captivity. There was a significant difference between upper management and the middle management and education positions. Upper management was near neutral (3.03) while the middle management and education positions were at or below disagree (1.50 and 2.05, respectively).

Continuing education experiences are apparently valued highly by all positions, as evidenced by an overall lsmean of 4.62 (important to very important) to statement #31. This could be looked upon as agreement with Hutchins and Smith (2003) who stated that in order

for modern institutions to accomplish their diverse goals, they must have innovative and well-trained personnel and make employee development a priority.

Analysis of Covariance

Analysis of covariance was used to gain insight into the relationships between the responses to the statements and the combined demographic score. If there is a significant, positive relationship (slope > 0) it indicates that as the demographic score increases (i.e. more professional involvement, greater formal education, etc.), the response to the statement also increases. Likewise a significant, negative relationship (slope < 0) indicates that as the demographic score increases the response to the statement decreases.

Captive Breeding/Reintroduction. Four of the six statements in this category had a statistically significant relationship or interaction with the combined demographic score.

1. Zoos and aquariums can best participate in saving endangered species from extinction by captive breeding for reintroduction.

Figure 2 shows the negative relationship between the estimated response to statement #1 and an increasing demographic score.

3. Captive breeding for reintroduction is a strategy that can be applied to nearly every species at risk of extinction.

Figure 3 shows the negative relationship between the estimated response to statement #3 and an increasing demographic score.

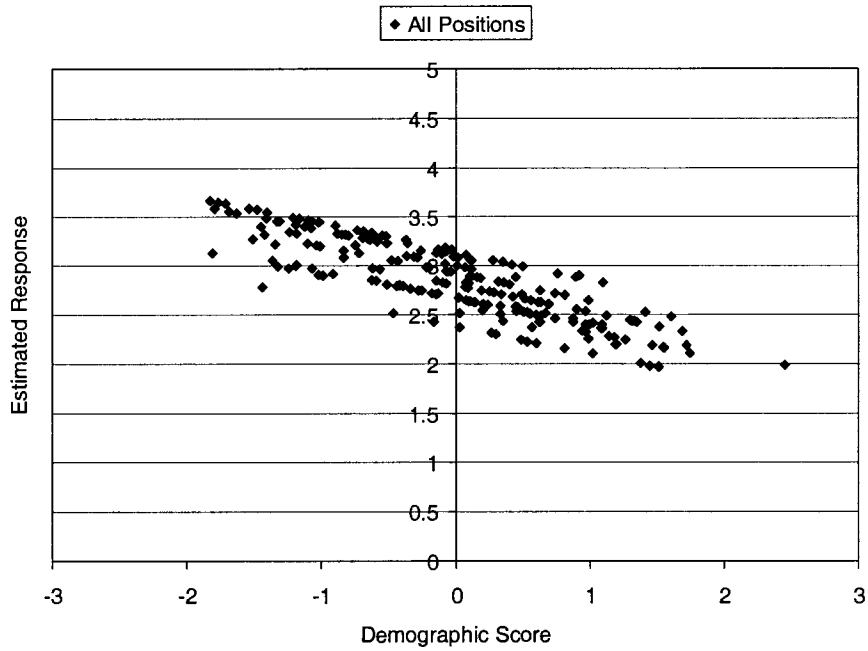

Figure 2. Interaction between the combined demographic factor and the responses to the "Zoos and aquariums' can best participate..." statement. Slope=-.2785, SE .1089, p=.0115

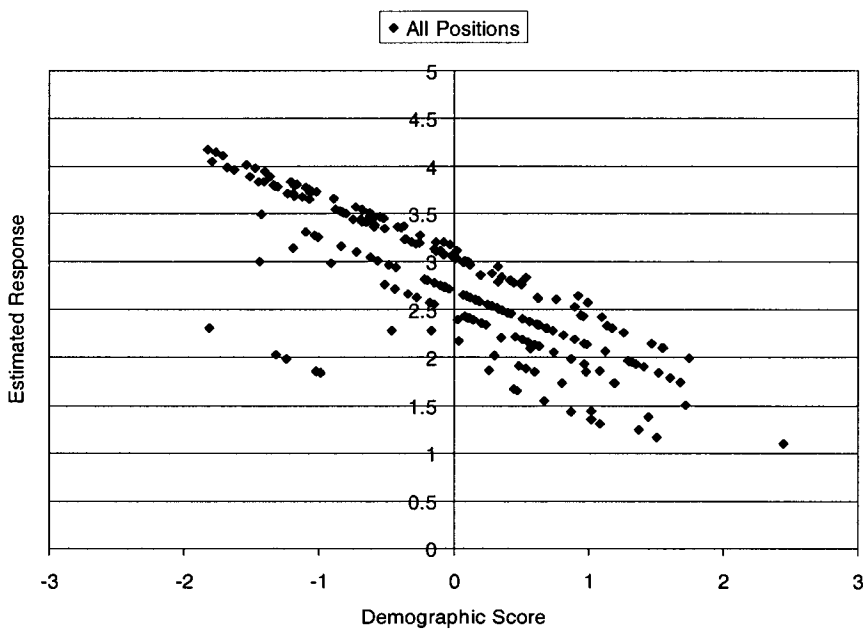

Figure 3. Interaction between the combined demographic factor and the responses to the "Captive breeding for reintroduction is a strategy..." statement. Slope=-.5588, SE .1229, p <.0001

4. Strategies that work towards the preservation of wildlife habitats and communities, not the intensive propagation of species one by one, are the keys to controlling the loss of biodiversity.

Figure 4 shows the positive relationship between the estimated response to statement #4 by the education position only and an increasing demographic score.

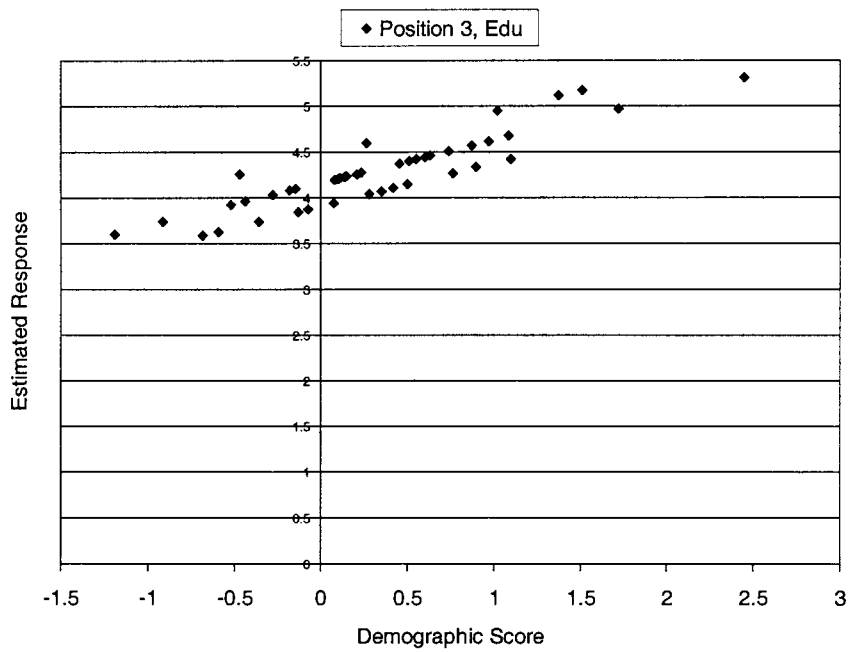

Figure 4. Interaction between the combined demographic factor and the responses of zoo educators to "Strategies that work towards the preservation..." statement. Slope=.4704, SE .1513, p=.0022

5. Captive breeding to sustain populations to reduce the need to use wild-caught specimens.

Figure 5 shows the positive relationship between the estimated response to statement #5 by the visitor services position and an increasing demographic score.

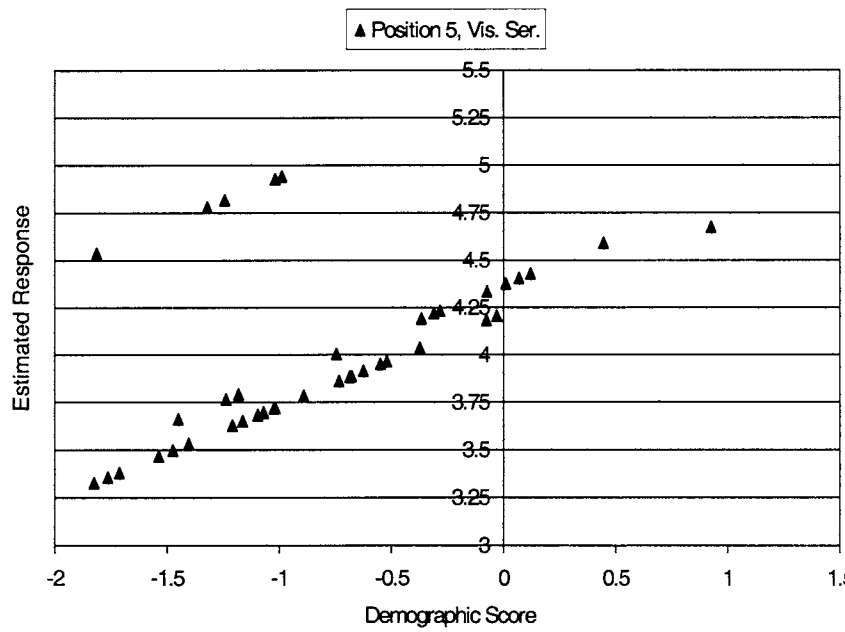

Figure 5. Interaction between the combined demographic factor and the responses of visitor service personnel to "Captive breeding to sustain populations..." statement. Slope=.4902, SE .1774, p=.0064

***In-situ* Conservation.** One of the eleven statements in this category had a statistically significant relationship and interaction with the demographic factor.

11. All new exhibits should have educational messages that emphasize *In Situ* or "in the wild" conservation – they should effectively build a bridge between the exhibit and what is happening to the animals in nature.

Figure 6 shows the negative relationship between the estimated response to statement #11 by both the middle management and education positions and an increasing demographic score.

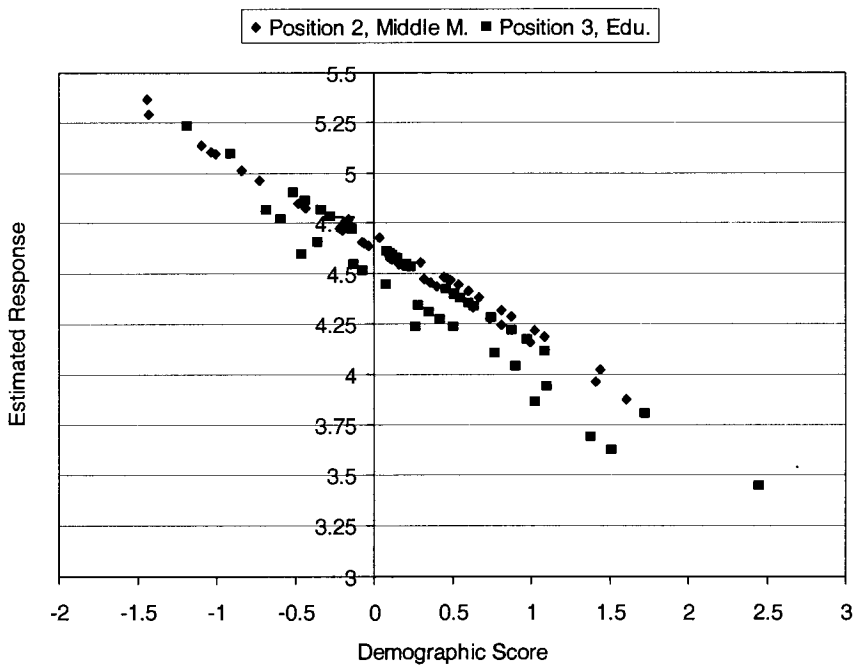

Figure 6. Interaction between the combined demographic score and the responses of position 2 and 3 to the "all new exhibits should have educational messages..." statement. Position 2 slope=-.4665, SE .1492, p=.0021; position 3 slope=-.4912, SE .1428, p=.0008

Conservation Education. Two of the six statements in this category had a statistically significant relationship with the demographic factor.

18. Informational signage about the natural history of a species or habitat is "conservation education".

Figure 7 shows the negative relationship between the estimated response to statement #18 and an increasing demographic score.

19. Zoos and aquaria educational efforts should be focused on children, in an effort to create enlightened decision-makers.

Figure 8 shows the negative relationship between the estimated response to statement #19 and an increasing demographic score.

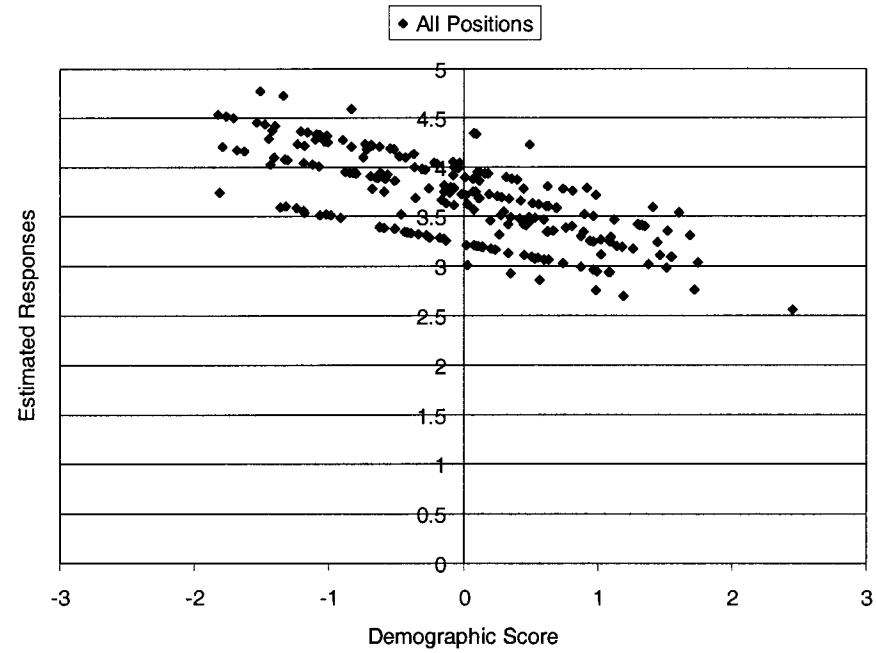

Figure 7. Interaction between the combined demographic score and the responses to the "Informational signage about the natural..." statement. Slope=-.2720, SE .1080, p=.0128

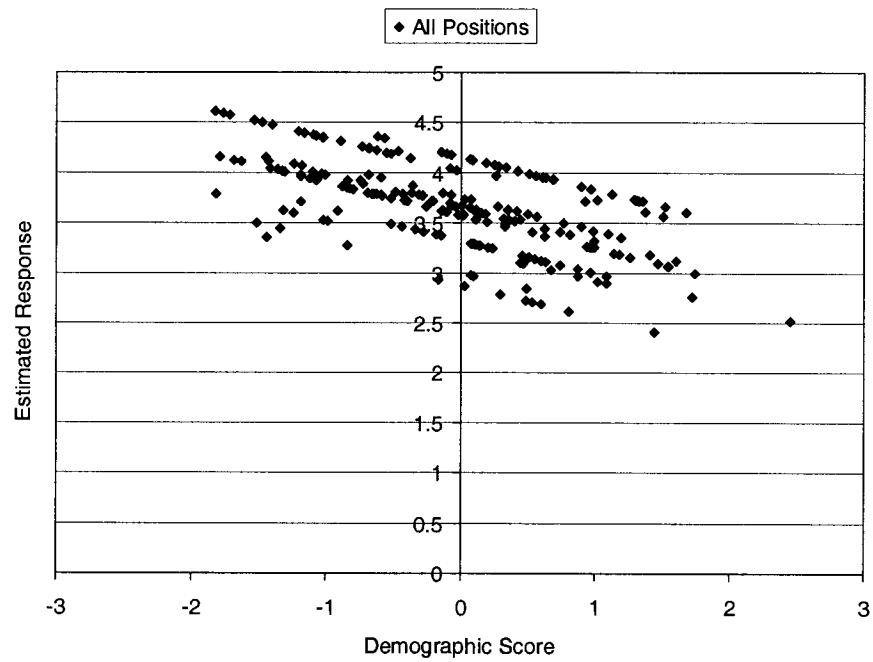

Figure 8. Interaction between the combined demographic score and the responses to "Zoos' and aquariums' educational efforts..." statement. Slope=-.3280, SE .1088, p=.0030

Political Involvement. One of two statements in this category had a statistically significant relationship with the demographic factor.

24. Proactive political involvement - including lobbying for regional and local legislation that benefits wildlife species and their habitats. (Type I)

Figure 9 shows the positive relationship between the estimated response to statement #24 by all positions of small sized institutions.

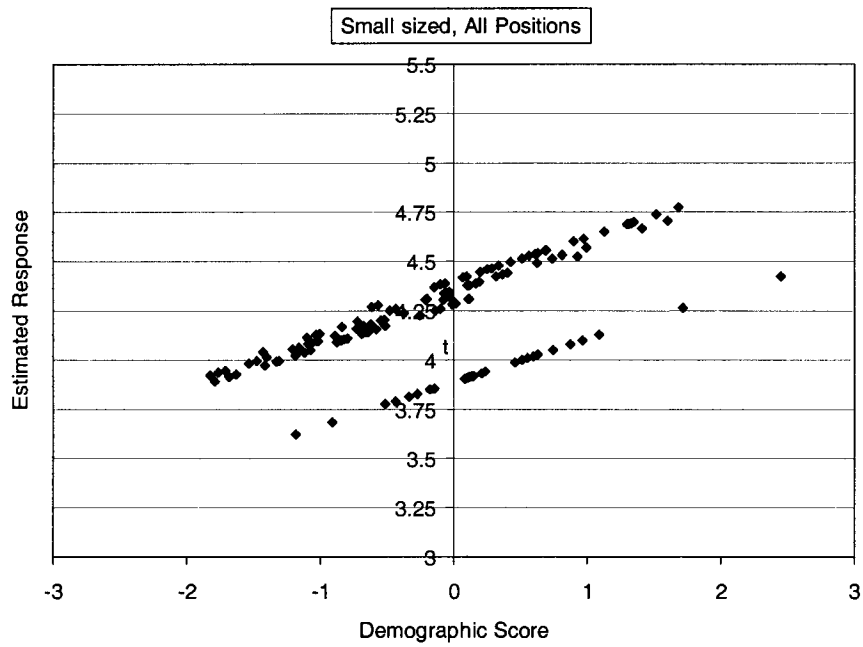

Figure 9. Interaction between the combined demographic factor and the responses by small zoo size to "Proactive political involvement – including lobbying..." statement. Slope=.2196, SE .0990, p=.0281

Zoo Management Topics. Two of the six statements in this category had a statistically significant relationship or interaction with the demographic factor.

26. Modern zoos and aquariums are experts at creating naturalistic artificial environments for wildlife, a skill that could pre-adapt them for work in ecological restoration.

Figure 10 shows the negative relationship between the estimated response to statement #26 and an increasing demographic score.

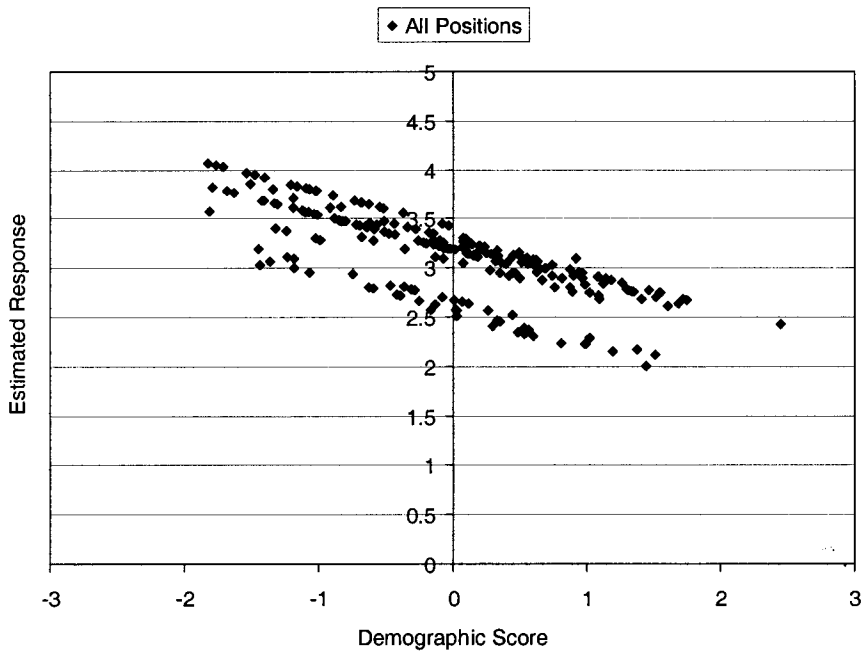

Figure 10. Interaction between the combined demographic factor and the responses to the "Modern zoos and aquariums are experts at creating..." statement. Slope=-.3540, SE .1023, p= .0007

30. The recreational benefits that zoos and aquariums provide to their local communities, by themselves, are enough to justify keeping wild animals in captivity.

Figure 11 shows the negative relationships between the estimated response to statement #30 and upper management at both large and medium zoo sizes. Figure 12 shows the positive relationship between the zookeeper position at the small zoo size for the same statement.

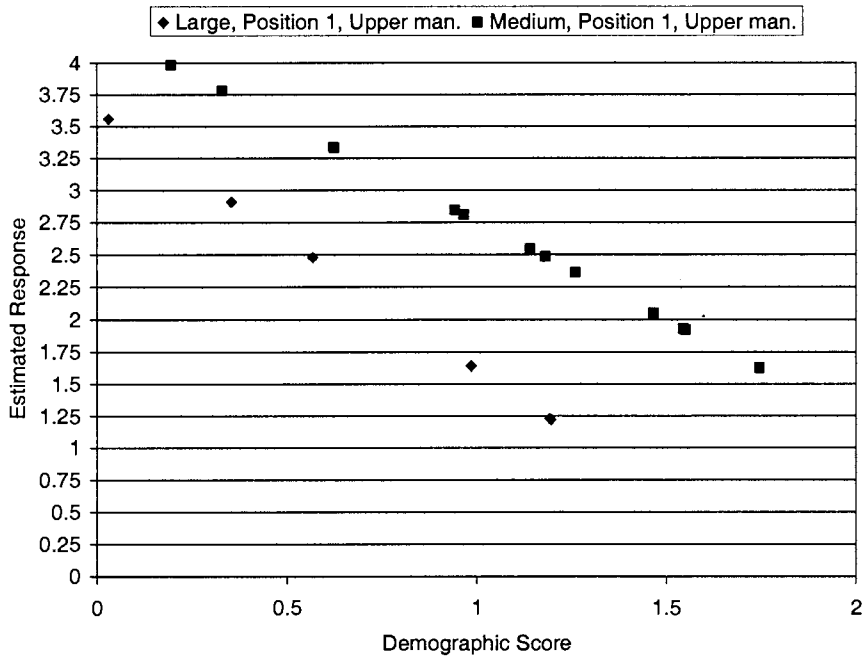

Figure 11. Interaction between the combined demographic factor and the responses of position 1 by large and medium zoo size to "The recreational benefits that zoos and aquariums provide..." statement.
Large zoo size, position 1 slope=-2.0028, SE .9558, p=.0379
Medium zoo size, position 1 slope=-1.5218, SE .6072, p=.0133

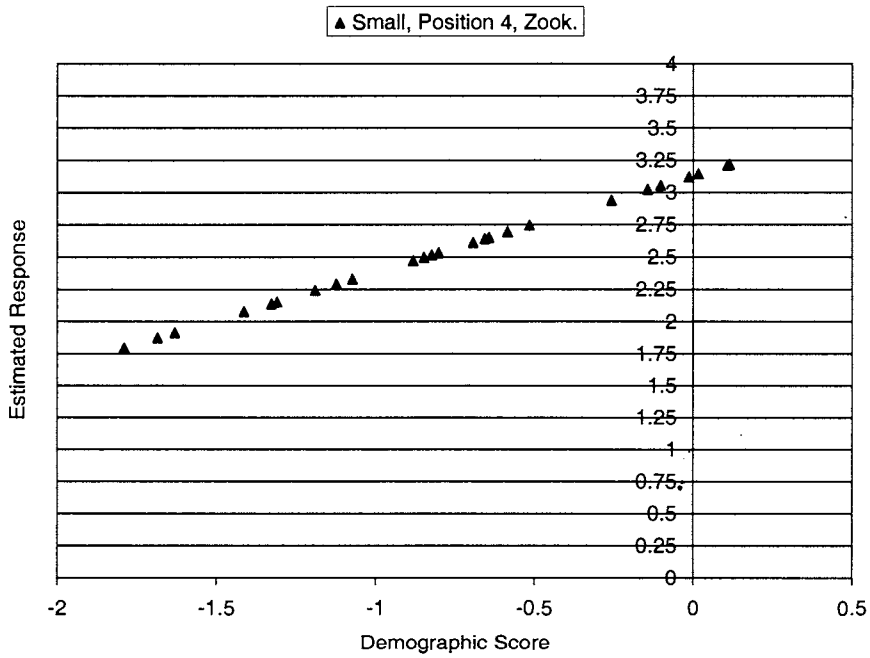

Figure 12. Interaction between the combined demographic factor and the responses of position 4, small zoo size to "The recreational benefits that zoos and aquariums provide..." statement. Slope=.7474, SE .3621, p=.0408

Analysis of covariance discussion

The analysis of covariance provided strong evidence to support our hypothesis. The results provided several instances that support the idea that as zoo and aquarium staff gain more experience, are involved with continuing education, are active in professional organizations, etc. (increasing demographic score) that their responses were consistent with the ideas presented in the proposed mission for modern zoos and aquariums. In general, a significant positive relationship (slope>0) represents an increasing response to a statement as the demographic score increases. Likewise, a significant negative relationship (slope<0) represents a decreasing response to a statement as the demographic score increases. The linear scale of the demographic score is standardized such that zero is equivalent to the mean.

It appears evident that the relationship of the estimated responses to statement #1 (Figure 2) is in agreement with the hypothesis. The negative relationship demonstrates that with an increase in the demographic score there is a decrease in the response. Conway (1995c), Hutchins and Conway (1995), and Hutchins and Smith (2003) would suggest that a deeper understanding of captive breeding for reintroduction would lend itself to the realization that this is not the best way for modern zoos and aquariums to participate in conservation. The negative relationship shown in Figure 3 for statement #3 further supports this idea by demonstrating that the demographic factor has a negative relationship with the response to the feasibility of reintroduction for most species. As a staff person is exposed to a wider range of experiences and information reflected in an increased demographic score, their understanding of the limitations (financial, political, disappointing success rate, space limitations at zoos and aquariums, etc.) are better understood.

The results from statement #4 (the need to preserve habitats rather than intensive propagation of species) suggests that an increasing demographic score does not affect all positions in the same way regarding the use of intensive propagation. It could be expected from Meffe, et al. (1997) and Conway (2000) that a positive relationship to statement #4 would be consistent with the proposed modern mission. However, upper and middle management, zookeeper, and visitor services positions had relationships that did not vary with an increasing demographic factor. Only the education position had a statistically significant positive relationship as shown in Figure 4. Perhaps this indicates that an increase in the demographic variables for education positions actually increased their understanding and acceptance of this idea better than other positions.

Although the overall lsmean rated statement #5 (captive breeding to reduce the need for wild-caught specimens) as important, only the demographic score relationship for visitor services was significant. They had a significant, positive relationship (Figure 5) while all other positions did not. This could indicate that increasing the demographic variables had the greatest effect on visitor services understanding and acceptance of this recognized use for captive breeding (Hutchins et al, 1996).

Conway (2000) suggested that all new exhibits should have educational messages that emphasize *in-situ* conservation, that they should effectively build a bridge between the exhibit and what is happening in nature. The results of statement #11 suggest that an increasing demographic score does not have a positive relationship to the responses; but rather has a significant negative one (Figure 6) for middle management and education positions. This would be the opposite of the expected result according to the general hypothesis. The other positions did not have a relationship significantly different from zero,

suggesting that an increase in the demographic factor did not relate to a change in the response to the statement.

Statement #18, referring to informational signage about the natural history of a species or habitat being "conservation education", follows as expected by the hypothesis (Figure 7) . Hutchins and Smith (2003) suggest that conservation education should encompass much more and actually move people to action. This concurs with widely accepted models of environmental education (Hungerford and Wilke, 1990). Regarding focusing educational efforts towards children, however, the results do not follow the hypothesis. Because of the urgency of conservation issues around the world, Conway (2000) suggests that modern institutions focus and push their conservation message to reach major decision-makers. However, this is contrary to the results of statement #19 (Figure 8). Clearly, this idea is not accepted by all staff and increased exposure (evidenced by an increasing demographic score) has the opposite expected relationship.

Figure 9 shows that for small sized zoos there is a positive relationship between the demographic factor and statement #24, regarding the importance of proactive political involvement. This is an expected response, considering the comments of Hutchins and Smith (2003) that modern institutions need to become more politically active and influence beneficial legislation. However, this positive relationship is not found for large and medium sized zoos. Their relationships are not significantly different from a slope of zero, meaning that an increase in the demographic score was not associated with an increase in their response. However, the overall lsmean was 3.90 (agree) which suggests an understanding of the importance of political involvement by most interviewees.

Relating zoo experience in creating naturalistic exhibits and the ability to use those skills in ecological restoration had a negative relationship (Figure 10) with the demographic score. Perhaps this relationship is a negative one due to the fact that increasing the demographic variables imparts knowledge of the complications of ecological restoration and the needs of specialized training and procedures. This would be the expected outcome anticipated by the hypothesis.

Considering the many suggested roles of captive animals, the hypothesis would expect a negative relationship to statement #30: 'the recreational benefits that zoos and aquariums provide to their local communities, by themselves, are enough to justify keeping wild animals in captivity'. However, the results varied depending on position and zoo size. Both the large and medium sized zoo upper management position had negative relationships (Figure 11). However, Figure 12 shows the positive relationship found for the small sized zoo zookeeper position. All other position relationships were not significantly different from zero. It is important to note that the demographic scores for the small institution zookeeper position were nearly all below the mean (less than zero) while the upper management scores were all above the mean. This suggests that increasing the demographic score does indeed tend to be associated with responses consistent with the proposed mission for modern institutions.

CONCLUSIONS

In general, for the purposes of this project, the proposed mission for modern zoos and aquariums revolves around these key points:

1. That captive-breeding for reintroduction is unlikely to be the best conservation option for most species. Due to limitations (financial, political, space, etc.) zoos and aquariums of the future must challenge themselves to use other methods to assist in the conservation of wildlife and their habitats (Hutchins, 2003).
2. Zoos and aquariums of the future should try to transform themselves to take a more active role in support of field conservation efforts (Conway, 2000; Hutchins and Conway, 1995; Hutchins, Wiese, and Willis, 1996).
3. Modern institutions must assume important roles in conservation education, especially of the adult decision-making populace (Hutchins, 1996; Hutchins, 2003; Hutchins and Smith, 2003).
4. Political involvement and influencing legislation should become an important major function of concerned and capable modern institutions (Hutchins, 1999; Hutchins and Conway, 1995; Hutchins and Smith, 2003).
5. Zoos and aquariums should become leaders and be viewed as resource centers in the conservation of wildlife (Conway, 2000).

The goal of this project was to gauge the acceptance and understanding of these principles by staff at AZA accredited institutions. It should be noted that the majority of significant differences were found between positions, not between zoo sizes. This supports the idea that the vision for modern zoos and aquariums is accepted and understood by staff with similar responsibilities, not by the operating budget sizes of their institutions. Different sizes of

institutions may play different roles in the unfolding of the modern vision, but the ultimate goals are held in common.

Upper management, middle management, and education positions consistently scored higher in this survey for nearly all demographic categories than the zookeeper or visitor services positions. This might be expected, considering the general increase in institution management responsibility and the potential ability of these positions to attend various off-site educational opportunities.

However, regardless of position, the following conclusions about the proposed mission for modern zoos and aquariums are suggested by the results:

1. Mean responses for all positions indicate that they agree that captive breeding for reintroduction is not the best method for zoos to contribute to wildlife conservation; however, when and where appropriate, it is an important contribution zoos and aquariums can make.
2. Captive breeding to maintain captive populations and reproductive technology development are viewed as important.
3. *In-situ* conservation is viewed by all positions to be a responsibility of modern zoos and aquariums. In fact, it is agreed that their greatest potential service to society is to directly help sustain wildlife in nature by sustaining wildlands, reserves, and species.
4. Mean responses for all positions indicate that they believe that zoo and aquarium exhibits should act as a bridge between the animals and what is happening in the wild.

5. Mean responses for all positions indicated that zoos and aquariums want to build their own *in-situ* programs, not simply provide money to other established organizations. They weakly agree that institutions will lose their relevance and credibility if they do not participate in *in-situ* conservation programs.
6. All positions agree that their institutions should become more proactive politically and attempt to influence beneficial legislation.
7. Networking with conservation organizations is considered important.
8. All agree that modern institutions should work to de-commercialize the exotic animal industry.
9. Mean responses for all positions indicate that continuing educational experiences and opportunities are viewed as important for zoo and aquarium staff.

Some aspects of the proposed modern mission were not supported by the results. There are two areas where significant differences occurred.

1. Conservation education. The fact that conservation education should have a component that motivates people to action, the lack of evidence of the impact of programs, and the need to develop effective tools to measure the outcomes appears to not be well understood. While there are many studies dealing with the impacts of various educational experiences on captive audiences (i.e. classes of students), few studies exist of the impacts on non-captive audiences (i.e. adults or families visiting zoos and aquariums) exist. There also appears to be some indecisiveness on the most effective group of people on whom to focus education programs. The proposed modern mission suggests it should be adult groups, since they are the ones responsible for current political and legislative decisions

impacting species survival. Generally, however, all positions are neutral to this idea and tend to agree more with the mindset of focusing on children in an effort to create enlightened decision-makers for the future. This may be due in part to the fact that, traditionally, training in zoo and aquarium education is geared towards children, not adults.

2. Substandard zoos. The role that modern zoos and aquariums should play in the regulation and elimination of substandard, non-accredited zoos and aquariums is not clear. These results suggest that on average, most staff are neutral.

The interview process, selection of interviewees, and data analysis were selected based on the hypothesis that as an individual expanded their education level, work experience, continuing education efforts, institutional knowledge, and professional organization involvement (especially with the AZA) that their agreement with these proposed key points would increase. This, in turn, would then be reflected in their responses relative to an expected outcome based on the proposed mission. Evidence for this was found in the results from several statements using a combined demographic score as the covariate in an analysis of covariance with the responses to each statement as the dependent variables. A significant positive relationship (slope>0) suggests that as the demographic score increases (education, professional involvement, etc.) the response value to the statement also increases. A significant negative relationship (slope<0) suggests that as the demographic score increases the response value to the statement decreases.

Only one statement had a significant relationship with an increasing demographic score that was not consistent with the proposed modern mission. This was in regard to the

suggestion that all new exhibits should have educational messages that emphasize *in-situ* or "in the wild" conservation - they should effectively build a bridge between the exhibit and what is happening to the animals in nature. There was a negative relationship with an increasing demographic score for the middle management and education positions, suggesting that even with an increasing demographic score (increased professional involvement, education, etc.) this part of the proposed mission is not necessarily embraced. This may relate to the possibility that, these two groups, feel that zoo and aquarium exhibits can have many purposes and shouldn't be limited to *in-situ* conservation messages.

The following statements had significant relationships with an increasing demographic score that were consistent with the proposed modern mission:

1. A negative relationship to the idea that zoos and aquariums can best participate in saving endangered species from extinction by captive breeding for reintroduction and that this could be used as a strategy for nearly every species at risk.
2. A negative relationship to the idea that modern zoos and aquariums are experts at creating naturalistic artificial environments for wildlife, a skill that could pre-adapt them for work in ecological restoration.
3. A positive relationship (education position) to the idea that the best ways to help control the loss of biodiversity are to work towards the preservation of wildlife habitats and communities, not the intensive propagation of species one by one.
4. A positive relationship (visitor services positions) to the idea that captive breeding to sustain populations to reduce the need to use wild-caught specimens is important to modern zoos and aquariums.

5. Despite a relatively high lsmean score (4.03 = agree), a negative relationship to the idea that informational signage about the natural history of a species or habitat is "conservation education". This suggests that those interviewees with higher demographic scores do realize that signage alone is not education; rather, programs motivating audiences to positive action do much more educating than found in graphics.
6. Despite a relatively high lsmean score (4.02 = agree), a negative relationship to the idea that educational efforts should be focused on children, in an effort to create enlightened decision-makers. This suggests again that those with higher demographic scores understand the urgency of the wildlife crisis and realize inspiring children may not result in positive action soon enough.
7. A positive relationship (small sized institutions) to the idea that proactive political involvement is important, including lobbying for regional and local legislation that benefits wildlife species and their habitats.
8. There was a negative relationship (for upper management of large and medium sized institutions) and a positive relationship (for zookeepers at small sized institutions) for the statement about the recreational benefits that zoos and aquariums provide to their local communities are enough to justify keeping wild animals in captivity. It would be estimated, to be consistent with the proposed modern mission, that there would be a negative relationship. It is important to note that the zookeepers' demographic scores are all below the mean (negative) and upper management's scores are above the mean (positive). This may provide the strongest example of an increase in the demographic score, supporting attitude

change. In this example, the increasing score was associated with a near reversal of responses.

SUMMARY

Many of the proposed issues involving the mission of modern zoos and aquariums are accepted and supported by the various positions at accredited institutions, regardless of zoo size. Furthermore, increased understanding of the proposed ideas are related to an individual's education, continuing education and work experiences, and professional organization involvement – especially involvement with the American Zoo and Aquarium Association. Given the urgency of wildlife conservation issues worldwide, the message of the proposed mission for modern zoos and aquariums needs to be communicated and effectively understood by zoo and aquarium personnel. Simply put, it means dedicating zoos and aquariums to environmental education and research, species and habitat conservation, cooperation and interaction with other like-minded organizations. Until a unifyed philosophy is accepted, zoos' and aquariums' collective potential will not be achieved. No matter what their position or institution size, staff we interviewed tended to agree with Hutchins and Smith (2003) and strive to be a part of a unified force that has the potential to become one of the most powerful and effective conservation organizations in the world.

APPENDIX A. AZA MEMBERSHIP BUDGETS

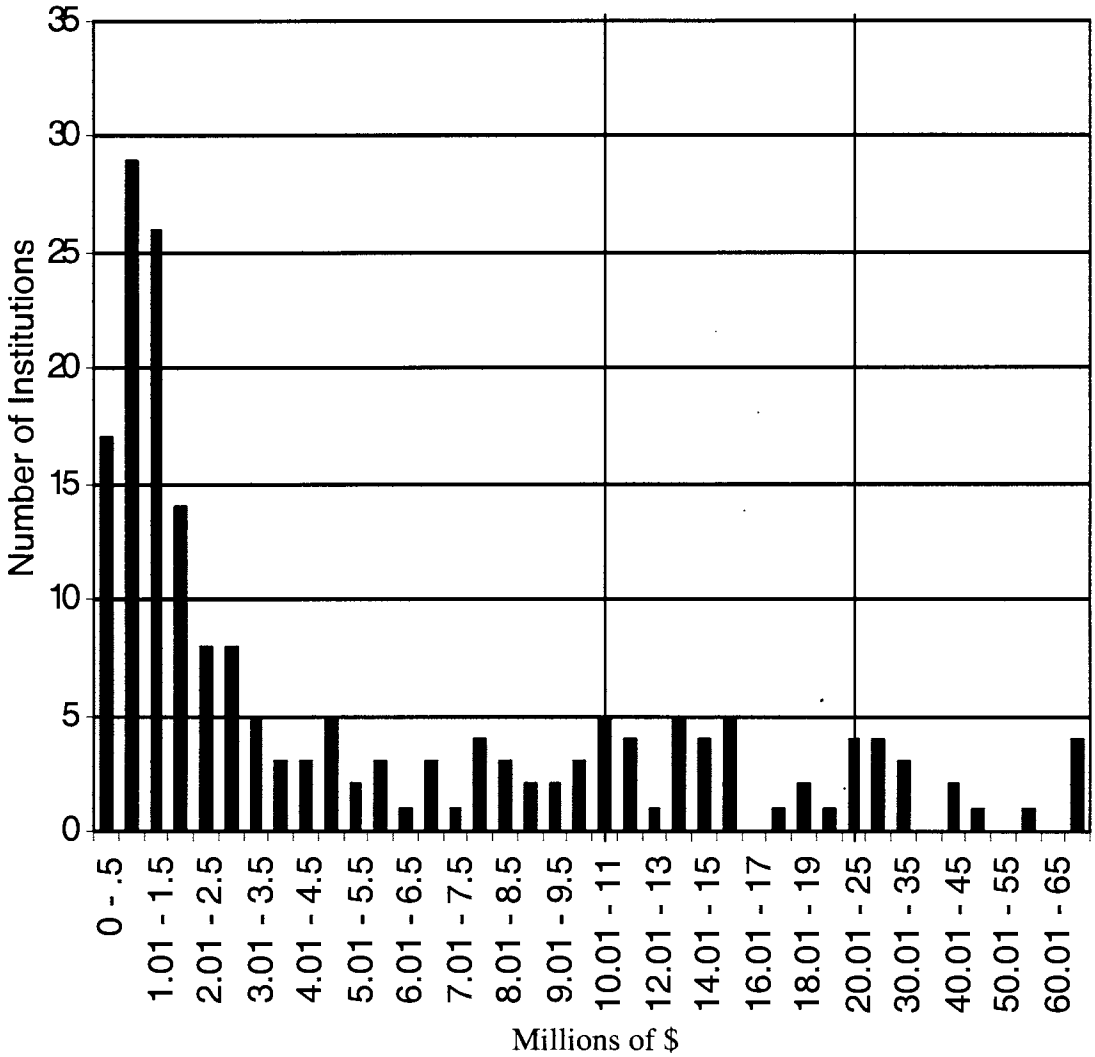

Figure 17. Operating budget sizes of 189 AZA accredited institutions (2001).
(0-10.0=.5 million$ increments; 10.01-20.0=1 million$ increments;
20.01->65.0=5 million$ increments)

APPENDIX B. AZA INSTITUTION LIST

Member Institutions of the American Zoo and Aquarium Association

Institution Name	Operating Budget size s=small (</=$5million) m=medium (>5 – 17$million) l=large (>/=17$million)	Region W=Western C=Central E=Eastern
Abilene Zoological Gardens	s	W
African Safari Wildlife Park	s	C
Akron Zoological Park	s	C
Alameda Park Zoo	s	W
Alexandria Zoological Park	s	C
Beardsley Zoological Gardens	s	E
Belle Isle Aquarium	s	C
Belle Isle Zoo	s	C
Bergen County Zoological Park	s	E
Bermuda Aquarium, Museum and Zoo	s	E
Binder Park Zoo	s	C
Birch Aquarium at Scripps 10, UCSD	s	W
Blank Park Zoo	s	C
Bramble Park Zoo	s	C
Brandywine Zoo	s	E
BREC's Baton Rouge Zoo	s	C
Brevard Zoo	s	E
Brookgreen Gardens	s	E
Buffalo Zoological Gardens	s	E
Caldwell Zoo	s	C
Cameron Park Zoo	s	C
Cape May County Park Zoo	s	E
Capron Park Zoo	s	E
Central Florida Zoological Park	s	E
Chaffee Zoological Gardens of Fresno	s	W
Chahinkapa Zoo	s	C
Charles Paddock Zoo	s	W
Chehaw Wild Animal Park	s	E
Cheyenne Mountain Zoo	s	W
Clyde Peeling's Reptiland	s	E
Cosley Zoo	s	C
Coyote Point Museum	s	W
Dakota Zoo	s	C
Dallas Aquarium at Fair Park	s	C
The Dallas World Aquarium	s	C
Dickerson Park Zoo	s	C
El Paso Zoo	s	C
Ellen Trout Zoo	s	C
Emporia Zoo	s	C
Erie Zoo	s	C
Folsom Children's Zoo & Botanical Gardens	s	C

Fort Wayne Children's Zoo	s	C
Fossil Rim Wildlife Center	s	C
Gladys Porter Zoo	s	C
Glen Oak Zoo	s	C
Great Plains Zoo and Delbridge Museum	s	C
Greenville Zoo	s	E
Happy Hollow Park & Zoo	s	W
Henry Villas Zoo	s	C
Henson Robinson Zoo	s	C
Honolulu Zoo	s	W
Hutchinson Zoo	s	C
International Crane Foundation	s	C
Jackson Zoological Park	s	E
John Ball Zoological Garden	s	C
Knoxville Zoological Gardens	s	E
Lake Superior Zoological Gardens	s	C
Lee Richardson Zoo	s	C
The Living Desert	s	W
Micke Grove Zoo	s	W
Mill Mountain Zoo	s	E
Miller Park Zoo	s	C
The Montgomery Zoo	s	E
National Aviary in Pittsburgh, Inc.	s	E
New York State Living Museum	s	E
North Carolina Aquarium at Fort fisher	s	E
North Carolina Aquarium at Pine Knoll Shores	s	E
North Carolina Aquarium on Roanoke Island	s	E
North Eastern Wisconsin Zoo	s	C
Northwest Trek Wildlife Park	s	W
The Oakland Zoo	s	W
Oglebay's Good Zoo	s	E
Palm Beach Zoo at Dreher Park	s	E
Potawatomi Zoo	s	C
Potter Park Zoological Gardens	s	C
Prospect Park Zoo	s	E
Pueblo Zoo	s	W
Queens Wildlife Center	s	E
Racine Zoological Gardens	s	C
Reid Park Zoo	s	W
Ripley's Aquarium	s	E
Riverside Zoo	s	C
Rolling Hills Refuge	s	C
Roosevelt Park Zoo	s	C

Rosamond Gifford Zoo at Burnet Park	s	E
Ross Park Zoo	s	E
Sacramento Zoo	s	W
St. Augustine Alligator Farm	s	E
St. Paul's Como Zoo	s	C
Salisbury Zoological Park	s	E
Santa Ana Zoo	s	W
Santa Barbara Zoological Gardens	s	W
Santa Fe Community College Teaching Zoo	s	E
The Seattle Aquarium	s	W
Seneca Park Zoo	s	E
Sequoia Park Zoo	s	W
Silver Springs	s	E
Staten Island Zoo	s	E
Steinhart Aquarium	s	W
Sunset Zoological Park	s	C
Tautphaus Park Zoo	s	W
Texas State Aquarium	s	C
The Texas Zoo	s	C
Topeka Zoological Park	s	C
Tracy Aviary	s	W
Tulsa Zoo and Living Museum	s	C
Utica Zoo	s	E
Virginia Zoological Park	s	E
Waikiki Aquarium	s	W
Warner Park Zoo	s	E
Western North Carolina Nature Center	s	E
Wildlife Safari	s	W
Wildlife World Zoo	s	W
The Wilds	s	C
The ZOO	s	E
ZOOAMERICA	s	E
ZooMontana	s	W
Albuquerque Biological Park	m	W
Aquarium of the Americas	m	C
Arizona-Sonora Desert Museum	m	w
Audubon Park & Zoological Garden	m	C
The Baltimore Zoo	m	E
Calgary Zoo, Botanical Garden & Prehistoric Park	m	W
Central Park Wildlife Center	m	E
Cleveland Metroparks Zoo	m	C
Colorado's Ocean Journey	m	W
Columbus Zoo and Aquarium	m	C

Dallas Zoo	m	C
Denver Zoological Gardens	m	W
Detroit Zoological Park	m	C
The Florida Aquarium	m	E
Fort Worth Zoo	m	C
Franklin Park Zoo	m	E
Houston Zoological Gardens	m	C
Indianapolis Zoo	m	C
Jacksonville Zoological Gardens	m	E
Kansas City Zoological Park	m	C
Lincoln Park Zoo	m	C
The Living Seas	m	E
Louisville Zoological Gardens	m	E
Lowry Park Zoo	m	E
Memphis Zoo	m	E
Miami Metrozoo	m	E
Milwaukee County Zoological Gardens	m	C
Minnesota Zoological Gardens	m	C
Mystic Aquarium	m	E
New Jersey State Aquarium	m	E
New York Aquarium	m	E
North Carolina Zoological Park	m	E
Oklahoma City Zoological Park	m	C
Omaha's Henry Doorly Zoo	m	C
Oregon Coast Aquarium	m	W
The Phoenix Zoo	m	W
Pittsburgh Zoo & Aquarium	m	E
Point Defiance Zoo & Aquarium	m	W
The Rainforest at Moody Gardens, Inc.	m	C
Riverbanks Zoo & Garden	m	E
Roger Williams Park Zoo	m	E
San Antonio Zoological Gardens & Aquarium	m	C
San Francisco Zoological Gardens	m	W
Sea Life Park Hawaii	m	W
Sedgwick County Zoo	m	C
Tennessee Aquarium	m	E
The Toledo Zoo	m	C
Utah's Hogle Zoo	m	W
Woodland Park Zoological Gardens	m	W
Aquarium of the Pacific in Long Beach	l	W
Bronx Zoo	l	E
Brookfield Zoo	l	C
Busch Gardens Tampa Bay	l	E
Cincinnati Zoo & Botanical Garden	l	C

Disney's Animal Kingdom	I	E
Los Angeles Zoo	I	W
Monterey Bay Aquarium	I	W
National Aquarium in Baltimore	I	E
New England Aquarium	I	E
Oregon Zoo	I	W
Philadelphia Zoological Garden	I	E
Saint Louis Zoological Park	I	C
San Diego Wild Animal Park	I	W
San Diego Zoo	I	W
SeaWorld Cleveland	I	C
SeaWorld Orlando	I	E
SeaWorld Antonio	I	C
SeaWorld San Diego	I	W
John G. Shedd Aquarium	I	C
Six Flags National Zoological Park	I	E
Smithsonian National Zoological Park	I	E
Zoo Atlanta	I	E

APPENDIX C. SURVEY INSTRUMENT

The Evolving Mission of Modern Zoos and Aquariums: An Internal Appraisal

Telephone Interview Questionnaire

CASE ID: ___ ___ ___ INT. ID: ___ ___ Date: ___ ___/___ ___/___ ___

Phone number: _____ - _____ - _____

Respondent's First Name: _____

Start Time: ___ ___:___ ___
End Time: ___ ___:___ ___
Length of Interview: ___ ___:___ ___

(Hello, this is {INT NAME} calling for the Blank Park Zoo, Des Moines, Iowa and Iowa State University)

(May I speak to {NAME} ?)

(Researchers at the university and the Blank Park Zoo are conducting a survey relating to the mission of modern zoos and aquariums. You have been chosen to participate, and I would like to interview you now. Information you provide will be compiled with all other respondents before it is reported, thus ensuring individual confidentiality. The results of this survey will be made available to zoo and aquarium staff along with other professionals through conference presentations and publications. The goal is to get an accurate picture of the current views on the directions that modern institutions are, or should be, taking. Ideally, these results will further discussion and increase awareness of these important issues. Your participation in this information gathering phase of this project is very much appreciated. You may stop at any time or decline to answer any question.)

The first set of questions relates to your personal background experiences.

1. Which of the following titles best describes your current position:
   Upper management___ Middle management/curator/head keeper___
   Education staff___ Visitor Services___
   Zookeeper___
2. How many years have you worked in this position? ____
3. What other Zoological institutions or Aquariums have you been employed at and what were your positions, please include any internships as well.

   Please start with the most recent: _____ _____
   Prior: _____ _____
   Prior: _____ _____
   Prior: _____ _____

4. Regarding your formal education, what was the highest level you achieved and what program were you in?
   High School ____
   College, Undergraduate ____ program _____
   M.S. ____ program _____

Ph.D. ____ program _____

5. Tell me if you have participated in any of the following types of Continuing Education experiences in the last 5 years:

College courses _____
Attending conferences _____
Workshops/training seminars _____
Employer-provided training _____
AZA School classes _____
Self-guided reading _____

Any others that I have not mentioned? _____

6. Please tell me if you belong to any of the following **National** professional organizations and to what capacity you have participated:

	Member	Attended Conference	Committee Member	Officer
American Zoo and Aquarium Association	_____	_____	_____	_____
American Association of Zookeepers	_____	_____	_____	_____
National Association for Interpretation	_____	_____	_____	_____
Any others not mentioned here? Other: _____	_____	_____	_____	_____
Other: _____	_____	_____	_____	_____

Now, I'd like to ask your opinion on several issues dealing with the future role of zoos and aquaria.
On a scale of 1 to 5, where 1 means **not important at all** and 5 means **very important**, please choose a number that reflects your beliefs as to what modern zoos and aquariums should work towards.

1. Captive breeding for reintroduction.

Not Important At All — Very Important

1 2 3 4 5

2. Captive breeding to sustain populations to reduce the need to use wild-caught specimens.

Not Important At All — Very Important

1 2 3 4 5

3. Financial support of conservation efforts in **other** countries.

Not Important At All — Very Important

1 2 3 4 5

4. Proactive political involvement - including lobbying for regional and local legislation that benefits wildlife species and their habitats.

Not Important At All				Very Important
1	2	3	4	5

5. Modern Institutions should work towards eliminating substandard, non-accredited zoos and aquariums.

Not Important At All				Very Important
1	2	3	4	5

6. Involvement in **local** conservation projects.

Not Important At All				Very Important
1	2	3	4	5

7. Continuing educational experiences for staff.

Not Important At All				Very Important
1	2	3	4	5

8. Networking and forming partnerships among conservation organizations.

Not Important At All				Very Important
1	2	3	4	5

9. The next question has to do with **On-site** public education at zoos and aquariums. What topics do you think should be emphasized during programs at the zoo or aquarium? After each suggested topic, please rate your opinion of its importance, using a scale of 1 to 5, where 1 means **not important at all** and 5 means **very important.**

	Not Important At All				Very Important
a. The animals in your collection (examples: species, where native to, etc.)	1	2	3	4	5
b. About biology using your collection to demonstrate (predator/prey, bird vs. mammal, etc.)	1	2	3	4	5
c. About zookeeping careers	1	2	3	4	5
d. About local environmental issues.	1	2	3	4	5
e. About worldwide environmental issues.	1	2	3	4	5
f. About human population growth.	1	2	3	4	5
g.About ways to change personal behavior relative to conservation issues.	1	2	3	4	5

Now, I'd like to ask you a few questions about **your own** institution.

1. How many full-time, permanent employees are at your institution during peek season times? _____

2. This question asks about your institution's annual attendance. As I read the following ranges of numbers, please stop me when I get to what you think your institution's approximate yearly attendance is.

<100,000 ____
100 – 400, 000 ____
400 – 700,000 ____
700, 000 – 1 million ____
1 – 1.5 million ____
1.5 – 2 million ____
2 – 2.5 million ____
- 3 million ____
>3 million ____

3. For the next two questions, please answer "yes", "no" or "unsure".
Does your institution have a formally adopted mission statement?

Yes ___ No ___ Unsure ___

4. If you know your institution has a mission statement, do you know whether or not "conservation" is addressed?

Yes___ No___ Unsure___

5. This question asks about your institution's annual operating budget. As I read the following ranges of dollar amounts, please stop me when I get to your institution's approximate annual operating budget.

<$100,000	____
$100 – 500, 000	____
$500,000 – 1 million	____
$1 – 2 million	____
$2 – 3 million	____
$3 – 5 million	____
$5 – 7 million	____
$7 – 10 million	____
$10 - 15 million	____
$15 – 20 million	____
$20 – 30 million	____
>$30 million	____

Now, I have some statements that I'd like you to rank according to how you feel about them. We will use a scale of 1 to 5, where 1 means "strongly disagree", 2 means "disagree", 3 is "neutral", 4 is "agree" and 5 is "strongly agree".

1. Captive populations of endangered species should be used to re-establish wild populations when appropriate and necessary.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

2. Maintaining captive populations of wild animals in zoos – **by itself** – is a significant contribution to the conservation of wildlife and their habitats in nature.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

3. All new exhibits should have educational messages that emphasize *In Situ* or "in the wild" conservation – they should effectively build a bridge between the exhibit and what is happening to the animals in nature.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

4. Informational signage about the natural history of a species or habitat is "conservation education".

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

5. Zoos and Aquaria seldom participate in species habitat restoration.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

6. Zoos and aquaria educational efforts should be focused on children, in an effort to create enlightened decision-makers.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

7. The recreational benefits that zoos and aquariums provide to their local communities, by themselves, are enough to justify keeping wild animals in captivity.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

8. The most important audience that educational programs can reach are adult groups, especially those in positions of the greatest influence, since they are the ones responsible for current legislative decisions.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

9. Zoos and aquaria could do a better job of teaching the public about the relationship between human population growth, environmental destruction, and the fate of wildlife and their habitats.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

10. Organizations such as the World Wildlife Fund, Conservation International, and The Nature Conservancy are better suited and more capable than zoos and aquaria to lead *in situ* conservation efforts of all kinds. Zoos and aquaria should simply provide these organizations with money, rather that attempting to build their own programs.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

11. Zoos and aquaria can **best** participate in saving endangered species from extinction by. captive breeding for reintroduction.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

12. *In situ* ,or "in the wild", conservation should be among the basic responsibilities of any modern zoological institution or aquarium.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

13. The goal of all zoo and aquaria based conservation programs should be to preserve animals and their habitats in nature, not simply to perpetuate captive populations.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

14. Education is the thing that zoos and aquariums do best. There is ample evidence that they make a positive difference for wildlife and nature.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Thank-you for your time so far. Now, I'm going to ask more questions about your institution.

1. First, I'm going to name some different types of "within" the organization communication techniques. Please tell me after each one if your institution uses that particular technique "never", "sometimes", or "often".

	Never	Sometimes	Often
a. Staff meetings that include all staff levels.	1	2	3
b. Small group meetings	1	2	3
c. Informal, unscheduled meeting	1	2	3
d. Daily reports	1	2	3
e. Employee Newsletter	1	2	3
f.Electronic forms of communication such as e-mail newsletters.	1	2	3
f. Are there any other forms of "within" the organization communication that your institution uses?			
_____	1	2	3

2. Now, tell me how well-informed you feel about the following topics at your institution. Please answer "Not informed", "Somewhat informed", "Informed", or "Very informed".

	Not informed	Somewhat Informed	Informed	Very Informed
a. Animal Management Programs	1	2	3	4
b. Educational Programs and Goals	1	2	3	4
c. Upcoming Special events	1	2	3	4
d. Institutional Master Plan	1	2	3	4
e. Institutional Mission Statement	1	2	3	4

3. Now, I'm going to name several different advertising venues. Please tell me if your institution uses them by answering "yes", "no", or "unsure".

	Yes	No	Unsure
a. TV ads	___	___	___
b. Radio	___	___	___
c. Newspaper	___	___	___

d. Billboards ___ ___ ___

e. Brochures ___ ___ ___

f. Web Page ___ ___ ___

g. Any other venues that your institution uses to advertise itself?

_____ ___ ___ ___

_____ ___ ___ ___

4. Does your institution offer **off-site educational** programs? Please answer "yes", "no", or "unsure".

Yes	No	Unsure
___	___	___

5. Who conducts your **On-site educational** programming? I will mention several types of employees, please answer "yes", "no", or "unsure".

	Yes	No	Unsure
a. Education staff	___	___	___
b. Docents/volunteers	___	___	___
c. Animal Care staff	___	___	___

d. Any other types of employees that are involved with **on-site educational** programming ?

	Yes	No	Unsure
_____	___	___	___
_____	___	___	___

6. Does the animal care staff use behavioral enrichment activities for the animals in their care? Please answer "yes", "no", or "unsure".

Yes	No	Unsure
___	___	___

7. Does the animal care staff use operant conditioning methods? Please answer "yes", "no", or "unsure".

Yes	No	Unsure
___	___	___

8. Is your institution active in breeding or holding SSP animals? Please answer "yes", "no", or "unsure".

Yes	No	Unsure
___	___	___

Ok, we are nearly finished, I only have 10 more questions that ask you to rate your feelings regarding statements made about zoos and aquaria of the future. Please rate your feelings about the statement by using the following scale: 1 is "strongly disagree", 2 is "agree", 3 is "neutral", 4 is "agree", and 5 is "strongly agree".

1. Zoos' and aquarias' greatest potential service to society is to directly help sustain wildlife in nature by sustaining wildlands, reserves and species.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

2. As holders of captive wildlife, zoos and aquaria have a moral obligation to assist directly in wildlife and habitat conservation.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

3. Zoos and aquaria that do not contribute to *in situ* conservation risk losing their relevance and credibility in a rapidly changing world.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

4. Modern zoos and aquaria are experts at creating naturalistic artificial environments for wildlife, a skill that could pre-adapt them for work in ecological restoration.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

5. Conservation education initiatives are likely to be most successful when focused on **local** conservation issues.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

6. Strategies that work towards the preservation of wildlife habitats and communities, not the intensive propagation of species one by one, are the keys to controlling the loss of biodiversity.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3	4	5		

7. Beyond recovering costs associated with breeding and rearing, large profits from the sale of animals should not occur.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3	4	5		

8. Captive breeding for reintroduction is a strategy that can be applied to nearly every species at risk of extinction.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

9. Artificial reproduction techniques developed by zoos (such as artificial insemination and embryo transfer) will someday be necessary to maintain genetic diversity in small, isolated wild populations.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

10. Political advocacy and a working relationship with local legislative figures should be a priority for zoos and aquaria.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

That is the end of the interview questions.

Thank-you very much for sharing your thoughts and your time with me today.

The information gained from this project will be shared with you and all AZA members after it has been analyzed.

Again, Thank-you.

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